



GREENHOUSE GASES AND AIR QUALITY

**GISERA | Gas Industry Social and Environmental Research Alliance**

# Methane contributions from coal seam gas holding ponds in Queensland

CSIRO scientists have completed a comprehensive desktop survey, evaluating the potential of Queensland's coal seam gas (CSG) water holding ponds to act as a source of methane and other greenhouse gas emissions.

CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) has evaluated existing data on emissions from CSG water holding ponds. This is the first step towards filling key knowledge gaps and improving the community's understanding of the potential greenhouse gas emissions (GHG) contributions from CSG water holding ponds in Queensland.

## Key points

- Communities are concerned about greenhouse gas emissions from CSG activities.
- More than 80 CSG water holding ponds are operational in Queensland. There are gaps in our knowledge about emissions from these ponds.
- In this desktop study, CSIRO scientists examined published literature for evidence of emissions from gas industry holding ponds. Scientists also assessed non-industry waterbodies (e.g., ponds and dams), using this data as a proxy to estimate potential emissions from CSG water holding ponds.
- The study found that CSG water holding ponds could represent a source of methane emissions, but detailed field surveys are needed to accurately quantify this amount.
- These findings will inform upcoming field surveys, data collection, and preferred methods to quantify emissions from CSG water holding ponds.

## Research objectives

Completed in June 2023, this desktop study aimed to address key knowledge gaps, reduce uncertainty and collate existing data on emissions from natural and constructed water bodies, with a focus on emissions from CSG water holding ponds.

The study will inform future data collection approaches and preferred methods for accurately quantifying methane emissions from CSG water holding ponds in Queensland. Current study results will assist CSIRO scientists to select a range of representative CSG water holding ponds for the direct measurement of GHG emissions and microbial processes.

## Addressing community concerns

Surveys conducted by GISERA in Australia over several years have revealed that GHG emissions and air quality consistently rank highly as issues of concern.

South-east Queensland hosts the largest CSG producing fields in Australia, with the number of wells in Queensland expected to reach 22,000 by 2050. The Surat and Bowen basins are the two key reservoirs in Queensland, and the focus of this study.

There are ongoing community concerns about methane emissions from onshore natural gas production. CSG water holding ponds are one potential source of methane and other GHG emissions for the industry.





CSG water holding pond and treatment facility in the Surat Basin.

## CSG water holding ponds and methane

CSG water holding ponds are used by industry to hold water from various stages of gas production, prior to treatment and beneficial re-use. CSG water holding ponds can produce methane, a known GHG.

In Queensland, there are more than 80 CSG water holding ponds operated by the gas industry. There is currently little data on GHG emissions from Queensland CSG water holding ponds, and existing information is limited and highly variable.

## How was this desktop study conducted?

Scientists conducted a detailed desktop study on the methane contributions from holding ponds, focusing on CSG water holding ponds and aquatic systems in Queensland.

To do this, CSIRO scientists:

- Collated and analysed company and publicly available data on methane emissions from CSG water holding ponds
- Reviewed data on the GHG emissions of natural and constructed water bodies such as lakes and ponds. (These 'non-industry' data were used as a proxy for estimating potential emissions from gas-industry water bodies)
- Identified appropriate tools and methodologies to quantify emissions
- Explored how emissions could potentially be managed or mitigated through additives and treatments.

## Identifying knowledge gaps

There is limited and highly variable information about methane emissions from CSG holding ponds and there is no publicly available data on the total methane emissions of CSG holding ponds in Queensland.

Both natural and constructed water bodies (such as ponds and dams) contribute disproportionately to GHG emissions, and this phenomenon is exacerbated by smaller volumes, shallow depths, and higher temperatures.

The two CSG water holding ponds that have been previously sampled on multiple occasions show wide variation, and the limited data gathered suggest industry ponds may emit significantly more methane than natural and constructed water bodies.

However, it is not known if these CSG water holding ponds are broadly representative, and there is no information relating to the key controls and contributors to methane emissions in CSG water holding ponds. Two new GISERA research projects have been approved to investigate these uncertainties.

## Proxy estimates

Because of the limited data available, in this study scientists used emission data from the natural and constructed water bodies as a proxy for CSG water holding ponds.

The proxy estimates from this study showed that potential emissions ranged from 15 to 30 milligrams per square metre per day ( $\text{mg}/\text{m}^2/\text{d}$ ). For comparison, reported methane emissions from an urban sewage treatment plant inlet was  $28,900 \text{ mg}/\text{m}^2/\text{d}$  and reported methane emissions from an 80-hectare landfill site was  $35,000 \text{ mg}/\text{m}^2/\text{d}$ .

Potential emissions varied according to pond size, presence of additional carbon and nutrient inputs, and pond location (temperate or sub-tropical zones).

While the proxy estimates are likely to be conservative, the concentrations proposed could potentially represent a significant source of methane: publicly available data shows that CSG water holding ponds in the Surat and Bowen basins comprise almost 65,000 megalitres of water with an aggregate surface area exceeding 1,100 hectares. By comparison, at full capacity Wivenhoe Dam in Queensland contains 1,165,240 ML and an area of 10,900 hectares.

## Next steps

CSIRO scientists will now:

- Undertake detailed field work and microbiological assessments. These surveys aim to accurately quantify methane emissions (and other GHGs) from CSG water holding ponds in Queensland.
- Address key knowledge gaps around organic carbon inputs to holding ponds (particularly ultra-fine coal particles) and the microbial dynamics with respect to methane production and consumption in ponds.

Taken together, these new studies will provide accurate measurements of methane emissions from CSG water holding ponds in the Surat and Bowen Basins.

## More information

Read the [full report](#) on this desktop study

Find out about further studies into [methane emissions](#) and [microbial processes](#) in CSG holding ponds

Read about [GISERA projects in Queensland](#).

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.